

USGS Resources in Support of the Spokane Valley/ Rathdrum Prairie Aquifer Investigation

The Spokane Valley/Rathdrum Prairie (SVRP) aquifer, which extends across Idaho and Washington, is the sole source of drinking water for more than 450,000 people. Water rights requests have recently been submitted that would substantially increase withdrawals from the aquifer. The public and state resource management agencies need an improved understanding of the SVRP hydrologic system in order to ensure appropriate management and protection of this valuable resource. The U.S. Geological Survey (USGS) has data and resources that are critical to address questions of water availability across the interstate boundary and has the non-regulatory status and experience to partner with the stakeholder community to provide the impartial science needed.

USGS and the New Study of the SVRP Aquifer

Answering water-availability questions regarding the SVRP aquifer will require investigations that apply both new and time-honored approaches to fill the many information gaps that exist in the conceptual hydrologic model of the SVRP aquifer. USGS scientists and data systems, covering all aspects of the hydrologic, geologic, geographic, and biological sciences, represent an invaluable resource for future hydrologic investigations within the SVRP area. The USGS can be called upon to apply a multitude of scientific expertise and analytical skills to address the water availability issue. Many have experience working on questions directly related to the quantity and quality of water in the aquifer. (See selected references.)

Current efforts by the USGS in the area include streamgaging (fig. 1), water-quality monitoring and assessment, studies of ground-



Figure 1. *Spokane River*

water/surface-water interactions, development of the National Map, mapping of surficial deposits, and earthquake hazard investigations. These efforts can be coordinated such that new investigations of the aquifer system can be done most efficiently. USGS databases, with consistent and comparable data, can be queried to determine existing data to maximize project funding. USGS scientists can bring to the efforts the most up-to-date monitoring and analytical technologies. For example, application of new geophysical and geochemical tracer techniques

could yield improved constraints on the volume and flow rate of the aquifer system, providing critical information about the maximum sustainable water yields from the aquifer. USGS experience at providing science in support of diverse stakeholder groups involved in contentious multi-state water issues is significant.

The current interest and controversy surrounding the availability of water in the SVRP aquifer, which is the sole source of water supply for more than 450,000 people, has numerous stakeholders with divergent views, including those of the two state water regulatory agencies. An interstate compact is a possible outcome of any study of this aquifer system. The USGS, as an impartial non-regulatory agency, has been found to be an acceptable partner by all parties in numerous similar studies throughout the U.S. and between the U.S. and its neighbors. In these studies, the USGS has worked closely with all stakeholders and community

scientists. Currently, the USGS has cooperative programs with more than 5,000 city, county, tribal, and state entities.

USGS Investigations in the SVRP Aquifer Area

The USGS has conducted studies in the Spokane Valley-Rathdrum Prairie (SVRP) aquifer area since the turn of the 20th century. Current USGS monitoring within the SVRP area includes 5 continuous-streamflow stations, 2 surface-water-quality monitoring site, 1 lake-level station, 4 ground-water-level monitoring sites, and 20 ground-water-quality monitoring sites. One of the longest continuous operating streamgaging sites in the western U.S. is a USGS gage on the Spokane River (fig. 2) and one of the longest records of ground-water levels in the country is for a well near Greenacres, Washington (fig. 3), which is measured by the USGS.

Early geologic mapping and study of the Lake Missoula floods elucidated the origins of the SVRP aquifer. Later studies using USGS streamflow data documented the strong interaction between the aquifer and the Spokane River. Thorough assessments of the aquifer yielded a model that described, on a daily basis, the ground-water level fluctuations and the spatial interactions of the

aquifer and river (fig. 4). Studies, undertaken as part of the National Water Quality Assessment Program (NAWQA), investigated the potential for transport of toxic metals, originating from historic mining, to the Spokane River and into the aquifer. Currently, NAWQA is expanding these analyses. In addition to the

numerous technical reports, the USGS also published a report (Molenaar, 1988) with the purpose of sharing with the public the results of scientific studies in a lay-reader format and style (fig. 5).

The USGS also has worked cooperatively with the Washington Department of Ecology and the Environmental Protection Agency to make a surficial geologic map and an assessment of the metal content of surficial sediments of the Spokane River from State Line to Latah Creek (Box and Wallis, 2002). The report provides a detailed geologic map of the distribution of sediments deposited by the Missoula floods and modified by later surficial processes, documents downstream variation of lead and compares the metal contents of various lithologies. The data provide an understanding of the physical and chemical processes that control the distribution of metals and can guide future remediation strategies aimed at reducing the human health and other biological impacts. The report and digital maps are available at <http://geopubs.wr.usgs.gov/open-file/of02-126>.

Extensive work also has been done in the flood plain and rivers above Coeur d'Alene Lake on distribution, mineralogy, and the physical and chemical processes related to mine tailings and

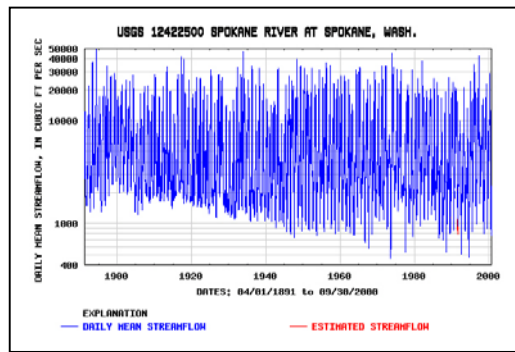


Figure 2. USGS gage on Spokane River—one of the longest continuous operating streamflow gaging stations in the western U.S.

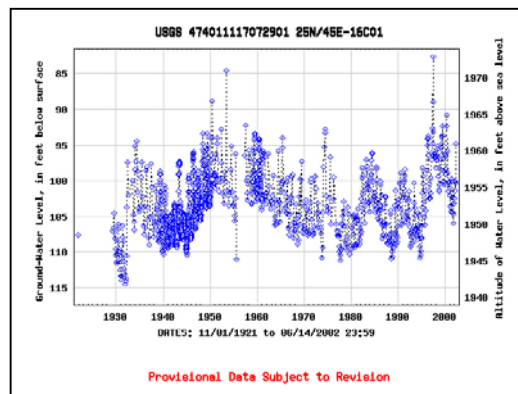


Figure 3. Greenacres, WA. One of the longest records of ground-water levels in the country.

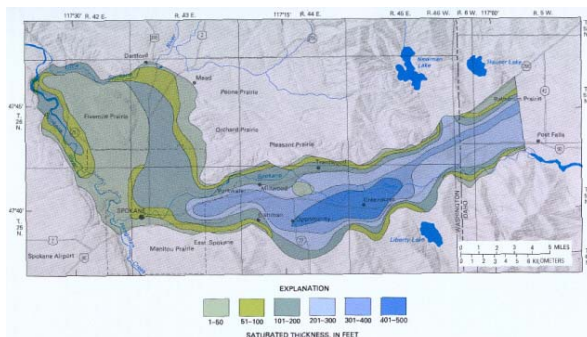
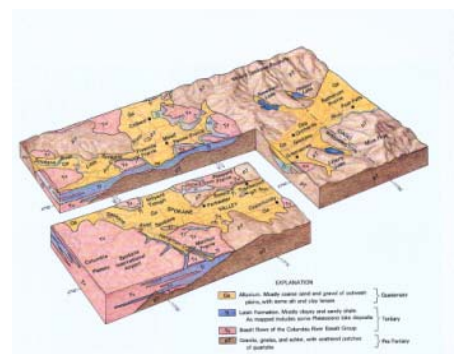


Figure 4. Saturated thickness of the Spokane aquifer. (From Bolke and Vaccaro, 1982.)

Figure 5. Generalized geology of the Spokane Valley region. (modified from Pardee and Bryant, 1925, and Bolke and Vaccaro, 1981.)



sediments enriched in lead, zinc and other metals, pore water chemistry, and surficial processes.

The USGS Earthquake and Landslide Hazards Program, in conjunction with the University of Washington, has installed seismography in the Spokane area. This network will allow for the analysis of future earthquake swarms.

The USGS currently is implementing a National Map in a four-county area that includes Spokane and Pend Oreille Counties in Washington and Kootenai and Bonner Counties in Idaho (fig.6). The National Map is a seamless, continuously maintained, and nationally consistent set of online, public domain, geographic base information that includes high-resolution surface elevation data, digital ortho-rectified imagery, land characterization data, geographic names, hydrography, transportation, boundaries of government units and publicly owned lands, and structures (used for E-911 applications). A critical part of the National Map implementation is the building of partnerships with local, state, federal, and tribal agencies to develop and display partner and USGS geospatial data. The National Map web-based map service can provide a consistent long-term website to not only maintain the National Map but also

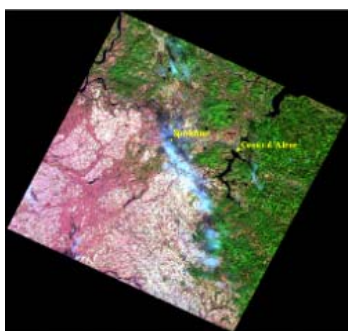


Figure 6. Landsat of SVRP area

serve additional science data collected throughout the area.

USGS Assessments of the Nation's Regional Aquifer Systems

Through its current and past programs the USGS has conducted local, regional, and national assessments of water availability and quality. USGS involvement in such assessments has been crucial in resolving complex and controversial natural resources problems.

From 1978 to 1995, the USGS developed quantitative assessments of 25 of the Nation's most important regional aquifer systems, as part of the Regional Aquifer System Analysis (RASA) Program (fig. 7). Many of the ground-water systems studied extend across

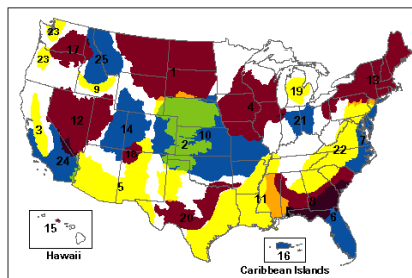


Figure 7. Regional Aquifer System Analysis study areas.

jurisdiction boundaries. These projects produced computer modeling tools for use by the local community. The USGS developed MODFLOW, a versatile ground-water flow model. This software has been widely used by scientists across the world for the last 20 years.

The USGS continues to evaluate the Nation's principal aquifers through a variety of programs including the Ground-Water Resources Program, which encompasses regional studies of multi-state ground-water systems, multi-disciplinary studies of critical

ground-water issues, access to ground-water data, and research and methods development. Program investigations provide unbiased scientific information and many of the tools that are used by federal, state, and local management and regulatory agencies to make important decisions about the Nation's ground-water resources. These regional assessments allow for the interchange of ideas and new technologies among a large group of scientists, and provide a valuable framework for other regional studies.

The data collected for these projects and other programs have resulted in the world's largest hydrologic database. The database includes data from the USGS National Streamgaging Network (a network of more than 5,000 sites). The data are readily accessible and are continually added to and preserved for America's future generations.

New technologies allow the USGS to deliver products in a rapid and near-real-time mode through the World Wide Web. An assessment of the hydrology of the Methow River Basin is such an example (<http://wa.water.usgs.gov/methow/>)

Who is the USGS?

Established over 100 years ago, the U.S. Geological Survey is the Nation's primary natural science agency. The agency investigates, describes, and documents the resources of the earth which directly affect our lives. These investigations span the fields of water, geology, geography, and biology, and include such things as: tracking and projecting the spread of Nile virus; analyzing and documenting the world's oil and mineral reserves; assessing earthquake, landslide, volcano, and flood risks; mapping the earth's surface; and

describing the Nation's water supplies, their availability and chemical characteristics, and the factors that control them. The value of the USGS to the Nation rests on its ability to carry out studies on national and regional scales and to sustain long-term monitoring, assessments, and databases of natural resources.

The USGS serves the Nation as an independent, non-regulatory fact-finding agency that provides scientific data and understanding about resource conditions, issues, and problems that span local to national scales. Because it has no regulatory or management mandate, the USGS provides impartial science that serves the needs of the public, including diverse stakeholder groups. The diversity of scientific expertise (10,000 scientists in 400 offices) enables the USGS to carry out large-scale, multi-disciplinary investigations that build on and contribute to a base of knowledge about earth systems. Scientific data, analysis, and tools developed by the USGS are subject to technical oversight, quality assurance, and peer review, ensuring that the information provided is accurate, reliable, and impartial, enabling use by all stakeholders in contentious negotiations. The USGS works closely with stakeholders and community scientists, ensuring relevant, applicable, and cost-efficient science.

Selected Reports Documenting USGS investigations in the Spokane Valley/Rathdrum Prairie

Bolke, E.L., and Vaccaro, J.J., 1981, **Digital-model simulation of the hydrologic flow system, with emphasis on ground water, in Spokane Valley, Washington and Idaho**: U.S. Geological Survey Open-File Report 80-1300, 43 p.

Box, S.E., and Wallis, J.C., 2002, **Surficial geology along the Spokane River, Washington, and its relationship to the metal contents of sediments (Idaho-Washington Stateline to Latah Creek confluence)**: U.S. Geological Open-File Report 02-126, 76 p.

Drost, B.W., and Seitz, H.R., 1978, **Spokane Valley-Rathdrum Prairie Aquifer, Washington and Idaho**: U.S. Geological Survey Open-File Report 77-829, 79 p., 10 pls.

Molenaar, Dee, 1988, **The Spokane Aquifer, Washington: Its geologic origin and water-bearing and water-quality characteristics**: U.S. Geological Survey Water-Supply Paper 2265, 68 p.

Newcomb, R.C., 1953, **Seismic cross sections across the Spokane River valley and the Hillyard Trough**, Idaho and Washington: U.S. Geological Survey Open-File Report, Tacoma, WA, 16 p.

Thomas, C.A., 1963, **Investigation of the inflow to the Rathrum Prairie-Spokane Valley aquifer**: U.S. Geological Survey unpublished report, 46 p.

Vaccaro, J.J., Bolke, E.L. and Tracy, J.V., 1983, **Digital analysis of ground water movement, water quality, and land-use effects in a stream-aquifer system**: Proceedings of the NWWA Western Regional Conference on Ground Water Management October 23-26, 1983, San Diego, California, Water Well Journal Publishing Co., Worthington, Ohio, p. 295-303.

Vaccaro, J.J., and Bolke, E.L., 1983, **Evaluation of water-quality characteristics of part of the**

Spokane Aquifer, Washington and Idaho, using a solute-transport digital model: U.S. Geological Survey Open-File Report 82-769, 69 p.

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